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Putting Farmers First in Sustainable Agriculture Practices

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Chapter One

INTRODUCTION

LONG before development agencies and banks, Western-educated technocrats and consultants introduced irrigation to increase rice production in Asia and elsewhere, the Balinese communities had developed and practised their own community-managed irrigation system called *subak*[1], which is now world-famous and is described in the literature on irrigation systems. Rather than a purely technical and hydrological process like the modern irrigation scheme, *subak* is a holistic socio-religious system with technical know-how on agricultural water management. Similarly, traditional sustainable agricultural practices, as will be described further in this paper, represent a holistic approach to food production and community welfare, as opposed to the narrow technological approach of conventional agriculture systems.

To get back to the irrigation example mentioned above, during the Indonesian Green Revolution era beginning in the early 1970s, the community irrigation system, particularly in Java and Bali, was taken over by the government and the entire system was reduced to merely an issue of technical management of water for agriculture. Farmers were reduced from water managers to water users. While practically all community-managed irrigation systems disappeared in Indonesia, the Balinese *subak* system still exists, albeit under severe constraints.[2] In the same manner, community seeds and cultivation practices were taken

over by single high-yielding varieties and monoculture practices.

In general, Western-educated engineers, governments and international agencies unfortunately had, and still have, the mindset that communities "have no technical know-how; they have to be given technology to improve their lives". They tend to think community-based technologies do not exist or are not viable. The *subak* case, which is just one example in terms of holistic water resource management for agriculture, and other similar practices have proven otherwise. The technical know-how and the management skills in agriculture do exist; it is just that they are ignored or sometimes considered non-marketable.

Thus, in discussing alternative agriculture, in the context of conventional agriculture and genetically modified (GM) crops that are being developed currently, it is important to note that alternatives exist; in fact, so-called "alternative" agriculture systems are still, to a certain extent, mainstream practices in many parts of the world. There is increasing recognition that "alternative" systems such as *subak* can constitute viable sustainable agricultural practices. *Subak* will be used frequently in this paper to provide an example of holistic practice in agricultural resource management, because it illustrates the complex interlinkages between ecology, culture and technology, it has existed in a community for hundreds of years and it has proven to be resilient, despite being ignored and underestimated.

This paper describes key principles and approaches of sustainable agriculture, particularly at local community level, as a key alternative to GM crops and industrial agriculture systems. This is followed by an account of the successes of sustainable agriculture practices in some parts of developing countries, illus-

trated by three case studies. The paper concludes by arguing for the need for a paradigm shift in agriculture and outlining what changes such a paradigm shift would entail.

CHAPTER TWO

PRINCIPLES AND APPROACHES OF SUSTAINABLE AGRICULTURE

SUSTAINABLE agriculture is a practice of various techniques and principles ranging from IPM (Integrated Pest Management) to permaculture, to agroecological systems. The key issue in sustainable agriculture is that there is *no single approach* that can be applied all over the world in a uniform manner; different techniques and systems are applied, *and* adapted, in different ecological and socio-cultural systems.

Sustainable agriculture follows the definition of sustainable development, i.e., meeting fundamental human needs while preserving the life-support systems of the planet. This is a concept that is easy to discuss but hard to implement because it requires a holistic approach within which science and technology are integrated with the social and political aspects of society, as well as with local and national economic development. However, there has been a decoupling of science and technology from the social and political processes that shape the sustainable development agenda (Kates et al., 2001, in Buchori, 2006). This is precisely what is happening with the development of GM crops, where scientists and technocrats develop new crop varieties and agricultural policies away from the reality of problems faced by farmers.

The holistic nature of sustainable agriculture is shown through the principles of IPM and agroecological approaches. Table 1 highlights the differences between IPM and non-IPM approaches in agriculture.

Table 1: Differences between non-IPM, conventional IPM and ecological IPM agriculture approaches

Aspect	**Non-IPM**	**Conventional IPM**	**Ecological IPM**
Decision/target based on	Pest	Pest and natural enemies	Flora and fauna in the agroecosystem
Basis of control	Calendar or based on damages	One-dimension control threshold*	Multiple-dimension control threshold**
Intervention method	Pesticides	Multiple intervention	Design of agroecosystem to minimize intervention
Diversity	Low	Low-medium	Medium-high
Spatial scale	Plot	Plantation area	Landscape
Time scale	Immediate	One planting season	Long term
Strategy	Chemically preventing	Responsive	Pre-emptive and responsive

Source: Buchori (2006)

Note:

* One-dimension control threshold means that pest control will be conducted when the threshold of only one dimension is crossed. For instance, farmers will conduct pest control when the population of a pest organism exceeds a certain level.

** Multiple-dimension control means that pest control is based on the threshold of several dimensions. For instance, farmers will conduct pest control after getting information on various dimensions, e.g., the population threshold of a pest organism, the population of natural predators, the environmental conditions, the price of pest control, safety, etc.

IPM evolved particularly in Southeast Asia as a response to pest attacks on high-yielding varieties (HYV) of rice in the 1980s, about 10 years after the Green Revolution was introduced. As Table 1 shows, it evolved from a simplified response to pest attacks into an ecological IPM approach, which is both pre-emptive and responsive. This shows that sustainable agriculture is a dynamic process in which knowledge management plays an important role. The principles of IPM are mainly: (1) grow a healthy crop; (2) enhance the role of natural pest predators in order to keep pest populations under control; (3) understand the functional roles of different species, with farmers therefore conducting weekly observation of their fields (taking the role of scientists); and (4) farmers as experts taking a central role in agriculture (Buchori, 2006). Decision-making is in the hands of farmers through observation and learning. In contrast, GM-crop development is largely decided by scientists, companies and government officials without involving farmers. Under a GM-crop regime, farmers are decoupled from their crops and work; they will be less competent as they have a limited understanding of the molecular techniques used. Also, the ability and even legal right to act will be reduced due to patented genes.

A more comprehensive set of principles for sustainability is provided in the agroecosystem approach. According to Altieri (2002), agroecology goes beyond the perspectives of genetics, agronomy, hydrology and so on, to devise an understanding of *co-evolution* at ecological and social levels of agricultural systems' structure and functioning. Agroecosystems are communities of plants and animals interacting also with their physical and chemical environment, which have been modified by people to produce food, fibre, fuel and other products for human consumption. Thus, sustainable agriculture is not merely to produce food but provides for other needs as well. As Uphoff (2002a) says: "Better human nutrition is a more important goal than

food production alone, and will not be achieved only through greater grain output."

With an understanding of the ecological relationships and processes in nature, agroecosystems can be enhanced to improve the production of food, fibre, fuel and medicinal herbs as well as other commodities more sustainably, with other and more sound ecological and social impacts (Altieri, 2002). Towards this end, ecological processes can be optimized by applying the following ecological principles (Rejntjes et al., 1992, in Altieri, 2002):

- Enhance recycling of biomass to optimize nutrient availability and to balance nutrient flows over time
- Provide the most favourable soil conditions for plant growth
- Minimize loss of energy and other growth factors, among others, through microclimate management, water harvesting and better soil management
- Diversify species and genetic resources
- Enhance beneficial biological interactions and synergies.

These are, as mentioned, ecological principles. In terms of economic components, agroecological approaches optimize the use of locally available resources. Socially, agroecological approaches build up and take full advantage of local knowledge and practices. Thus, the strategy is to encourage development methodology that supports farmer participation, use of traditional knowledge and adaptation of farm enterprises to fit local needs and match up with socio-economic as well as biophysical conditions (Altieri, 2002). In this respect, agroecological practices

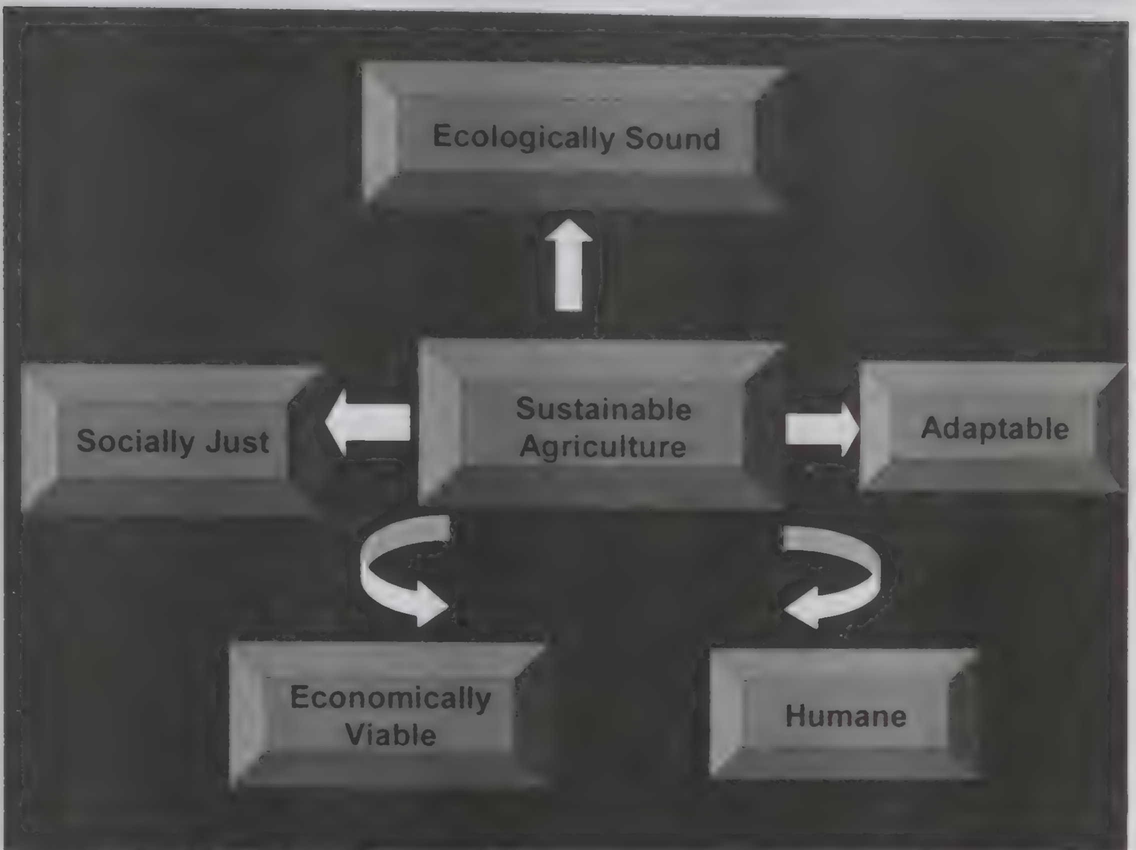
are often enhanced and strengthened by local institutions and policies as opposed to uniform techniques at the national and global level. A key principle of sustainable agriculture is therefore the development, enhancement and protection of local biodiversity and local social capital, including local institutions, cultural practices, etc.

The *subak* situation described at the beginning of this paper is a case in point. *Subak* is cultural capital for the Balinese in terms of managing water resources for agriculture (Pitana, personal communication, 2004). The implementation of *subak* involves natural resources (water), human resources (experts on water systems) and cultural resources (Hindu- and Balinese-based institutional arrangements). The technical know-how is developed and governed by these three aspects. When modern irrigation systems were brought in, a complex interactive system was replaced by an alien single unit system based on a single aspect: the technicality of bringing water to the fields. This system reduced farmers from managers to mere water users, with their competence overruled and their fate decided by government water "experts".

Thus, sustainability has to do with embracing the fundamental character of interactions between nature and society (Kates et al., 2001, in Buchori, 2006). Figure 1 provides the elements and interactions of sustainable agriculture.

Two further elements can be added to the diagram in Figure 1: spirituality and culture. Again, the *subak* system serves as an example of a system that is rooted in religious (i.e., spiritual) and cultural elements. Another example of a spiritual element is the practice of providing a goddess status to staple plants such as rice and corn. In Java and Bali, farmers traditionally treated rice as the Goddess Sri (*Dewi Sri*). The entire act of

Figure 1: Elements of sustainable agriculture



Source: Buchori (2006)

farming from seed selection, to sowing, to reaping the harvest was centred around the treatment of rice as a living being. Just before harvest, for instance, the Javanese farmers conducted the *wiwitan* ceremony. This is a ritual where farmers offered part of their harvest and various kinds of food to the Goddess Sri and asked her to bless their harvest. In effect, this is a seed selection process because farmers took the best rice stalks from the middle part of their field to be offered to the Goddess. These stalks were then saved and planted in the next season.[3] Such rituals were gradually abandoned with the introduction of the Green Revolution in Java, but still exist in Bali, albeit in a reduced form.

From the scientific and technological point of view, such rituals may be seen as a "waste of time and effort". But in sustainable agriculture, such rituals constitute a communion with nature, cultural identification, as well as part of the development of knowledge about local agroecological systems. And that is what sustainable agriculture is all about – providing nutritious food, medicine and fibre without taking cultural identities and power away from communities.

Chapter Three

SUSTAINABLE AGRICULTURE IN PRACTICE

THERE is a growing body of evidence that sustainable agriculture practices have been able to increase productivity with minimum damage to the environment compared to monoculture, industrial-scale agriculture. Notable among this is a study conducted by the University of Essex since the early 1990s. The study involved projects on more than four million farms in 52 countries to explore how the world's poor can feed themselves using cheap, locally available technologies that will not damage the environment. The findings showed that switching to environmentally and socially responsible farming improves harvests by an average of 73% (Greenpeace, 2001).

More recently, an international study team, led by Jules Pretty from the University of Essex, strengthened the above finding. The team found that farmers in 286 projects in 57 countries have improved crop productivity since the early to mid-1990s by an average of 79% while simultaneously increasing water use efficiency and carbon sequestration, and reducing pesticide use. Farmers used a variety of resource-conserving technologies and practices ranging from IPM to agroforestry to water harvesting and livestock integration (Lim, 2006).

Alternative or sustainable agriculture practices are often not new but draw on traditional knowledge and practices, some of

which have now been positively evaluated by scientific methods. With appropriate development and applications, they offer opportunities to increase food production (Uphoff, 2002b). Case studies presented in Uphoff (2002c) show that new and better combinations of plant, soil, water and nutrient management practices, combined with livestock and/or fish and IPM, can increase production by 50 to 100%, sometimes even 200 to 300%. The crops reported in the case studies include rice, corn, beans and potatoes. The experiences presented were not of particular technologies for selected crops (as is the case with GM crops) but rather the application of *principles* (italics from Uphoff) that can capitalize on existing genetic potentials. For instance, even a simple principle of intercropping two rice varieties can reduce crop losses and raise yields, as demonstrated in Yunnan province, China.[4] This simple technique stems from knowledge about local agroecology, rather than a single technical idea.

While there are many reports showing the success of transitions to sustainable agriculture, these are mainly local- or community-based initiatives or studies at research centres spread out over different areas. In most cases there are no national policies or institutionalization of these efforts and national governments also rarely design programmes for sustainable agriculture. The exception is perhaps IPM, which was adopted as a national policy in many Southeast Asian countries during the 1980s. For example, Indonesia adopted IPM through a Presidential Decree in 1984. Since then, farmer field schools were established and within a few years there was a substantial reduction in pests as well as in foreign exchange spending for importing pesticides. Another example is the adoption of SRI (System of Rice Intensification), as described in one of the cases below.

The following cases further illustrate some of the benefits of sustainable agriculture practices.

Pesticide-free village

Punukula, a small, predominantly tribal, village in the state of Andhra Pradesh, India, declared itself pesticide-free in 2003, even for crops which are notorious for their high pesticide consumption. Farmers in this village claim that their ecological approach to pest management is saving them Rs 3 million (about US$64,000) a year, as reported by Kuruganti (2005).

Farmers in Punukula began to use pesticides about 15 years ago when migrant farmers introduced cotton. Initially, the pesticides worked well and farmers bought them on credit from the shops in a nearby town. Gradually, however, pests became resistant to the pesticides and farmers had to spend more money to buy greater quantities of pesticides. In addition to selling pesticides, fertilizers and seeds on credit, the agrochemical dealers also began lending money to farmers at high interest rates. When the debt trap closed in, farmers who could not repay their debts began committing suicide.

In 1999, a local non-governmental organization, the SocioEconomic and Cultural Upliftment in Rural Environment (SECURE), introduced ecological methods of farming. Five self-help groups run by village women provided the determination and support to help make this shift possible. Instead of chemical sprays, the farmers began preparing sprays made with inexpensive local materials such as neem seed powder and green chilli-garlic extract. The sprays were supplemented by hormone traps to attract moths and destroy them before they started mating. Some farmers also used "crop traps": planting marigolds and castor, which the pests preferred, alongside cotton.

One season was enough to demonstrate the difference: spiders, wasps and beetles – which feed on cotton pests – returned to the fields once the chemical spraying stopped. In the next season, many other farmers tried out this new approach. While men still found it more practical to buy pesticides, women took on the work of preparing the ecological anti-pest sprays, and ensured that no one brought pesticides into their village.

By 2003, most farmers in this 200-household village had stopped using pesticides. The new methods were used not only in cotton fields, but for chilli and paddy as well. In August 2004, the women's groups, with support from SECURE, bought a machine to crush the neem seeds into the powder used for the sprays. Punukula farmers now have money to invest in house repair, buy land, invest in livestock and repay their debts. They believe that the way to get rid of pests is to rid their fields of pesticides. Neighbouring villages are beginning to show an interest in the approach because of the successes.

Adoption of SRI in Cambodia

SRI (System of Rice Intensification) is a method of rice cultivation that combines using less water, less seeds and more organic fertilizer, among other efforts.[5] The government of Cambodia has integrated SRI promotion into its national development plan for 2006-2010, given the results demonstrated with these methods. As reported on the SRI Group website at Cornell University (January 2006), SRI was introduced by the director of the Center for Studies and Development of Cambodian Agriculture (CEDAC), Dr. Koma Sang Yaing, who first tried SRI methods in 1999. In 2000, CEDAC was able to get 28 farmers to try out the methods for themselves. The good results encouraged 400 farmers to use SRI in 2001, and 3,000 farmers in 2002. By the end of 2005, the total was at least 40,000 farmers, and as

many as 50,000 were using SRI. The spread has been driven particularly by farmers' own initiatives.

CEDAC conducted an evaluation of the SRI experience of 120 farmers who had used SRI methods for three years (2001, 2002 and 2003). Even though not all the farmers used all of the SRI methods as recommended, the evaluation showed that even incomplete use of SRI had enabled them to harvest 2.75 t/ha on average, compared to 1.34 t/ha with conventional means. Fertilizer use was reduced from 116 kg/ha to 67 kg/ha on average, and chemical pesticide use declined from 35 kg/ha to 7 kg/ha. Costs of production were reduced by half, and household income, even with use of SRI on only part of the rice land, almost doubled. Fifty-five percent of the farmers who were surveyed said SRI reduced their labour requirements, while only 18% said it increased labour requirements; 27% said it made no difference.

Another evaluation of SRI was conducted by GTZ, the German development agency, in February-April 2004. Data were gathered from 500 farmers, randomly selected in five provinces, 400 of them being "SRI users" and 100 "non-SRI" for comparison. Not all of the "SRI users" were using all the recommended practices, or using all as recommended, but even so, a 40% increase in yield was documented, along with a 75% increase in net income per ha, due in part to substantial reductions in the farmers' costs of production. Most significantly, this study found that there was no real increase in labour requirements for using SRI. Labour savings made during transplanting (a time of peak labour demand, when 10 person/days per ha were required) offset the increased labour needed for weeding (which could be done with flexible timing). Also, reducing the need for cash expenditure at the start of the planting season, when household cash reserves are lowest, was beneficial for farmers.

One farmer who received an award for highest SRI yield attained an average level of 14.6 t/ha, with one crop-cut of 2 kg/m^2 (20 t/ha).

The Cambodian Ministers of Agriculture and Environment have promoted SRI because it fits with the national strategy for the agricultural sector: intensification (including SRI), diversification (facilitated by SRI gains in land productivity), compost use to improve soil fertility, and fish culture (SRI makes it possible to free up land area for fish ponds). Farmers are now making many modifications in their farming systems, based on SRI, to diversify production for both better income and nutrition.

Experience of an organic rice farmer in Java, Indonesia

Giyanto, a farmer in Delanggu, Central Java, Indonesia, switched to organic farming in 1999.[6] This was the period of economic crisis when the price of inputs soared due to the declining value of the Indonesian currency (rupiah) vis-a-vis the US dollar. As agrochemicals and their component materials had to be imported, their price increased drastically. Farmers could not afford the use of agrochemicals.

Giyanto began organic rice farming by adopting the local, almost-extinct variety of *menthik wangi*. He found that the production costs were reduced, partly by using the traditional method of *singgang*. In this method, during the first rice harvest, farmers leave 10 cm of the stalk, measured from the ground. The plant will flower again and produce another harvest of rice. The first batch of rice is harvested after 120 days of planting, and the second, after the *singgang* treatment, can be harvested after 80 days. This reduces the cost twofold. However, the *singgang* method is not easy and requires patience. It can only be done twice to ensure quality; but this practice is

also a way to maintain pure lines of a certain variety. This method does not work for conventional rice farming.

Giyanto also rears chickens and uses their waste as manure. He can produce 1 ton of manure a month from his 1,000 chickens, enough to fertilize 2,000-3,000 m^2 out of his 8,000 m^2 of farmland. In addition, he does not plant paddy throughout the year like many Javanese farmers. Giyanto plants onions during the dry periods of June-November when there is less water for two reasons. Firstly, this reduces the risk of rice harvest failure due to lack of water. Secondly, it breaks the cycle of rice pests. When rice is planted all the year through, the pests have plenty of food on which to grow and they become prolific. This can lead to a disproportionately high pest population. Planting a non-rice crop even for one season breaks the food supply of the pests and therefore can reduce pest incidence in the next rice planting season.

Giyanto sells his rice harvest to SAHANI (*SAHAbat PetaNI* or "friend of the farmer"), an organic fair trade shop in Yogyakarta whose management is farmer-driven. This shop collects the harvest from farmers, thus reducing the cost incurred by farmers. The shop buys the rice at a fixed price, so farmers do not have to face fluctuating market prices. Giyanto said SAHANI gives a better price for the organic produce compared to the market price for non-organic rice. For instance, the price for organic *menthik* rice is Rp 5,000/kg while that for the non-organic variety is Rp 4,700-4,800 per kg.

In Indonesia, Java is the centre of agrochemical agriculture, particularly for rice. The organic movement has grown over the past 10 years but faces many constraints. For one, most farmers own either only 0.3 ha of land (Giyanto is a rare exception) or no land, i.e., they are farm labourers with no decision-mak-

ing power over what to plant. Secondly, farmers have been so used to agrochemicals over the last 35 years that it is difficult to shift their mindset; they have also lost much of their cultural wisdom. Thirdly, farmers want better and fixed market prices for their organic produce as the initial costs are indeed higher since the soils have been degraded for so long. However, there are pockets of farmers who have realized the value of organic farming and have gradually made the transition that Giyanto has made.

Lessons learnt

Several lessons can be learnt from the above cases. None of them involve a single technological innovation *per se*. Rather, they involve policy, institutional and marketing issues. First, in India, it was the women's groups that made the shift to sustainable agriculture practices. The role of women has indeed been sidelined in the Green Revolution. Projects to promote the Green Revolution in the villages mostly involved men; this took away many of the decision-making powers (crop selection, food storage, etc.) and jobs (weeding and harvesting) that used to be the domain of women. The shift from sustenance to a market economy was made by men. At the same time, women suffered serious health impacts due to the excessive use and misuse of agrochemicals, particularly pesticides. The introduction of GM crops is likely to repeat the situation as these crops are targeted towards the market rather than for local food security. Thus, sustainable agriculture is a way to restore the domains of women in food production as well as to improve peoples' health, local competence and economy/income.

In the Cambodian case, it was the research institution that became the agent of change together with farmers, leading to the adoption of alternative methods by the government. The

research institution took the initiative to try the new method, but farmers were involved in the trials and had the decision-making power on whether or not to adopt SRI. Indeed, farmers adopted this method partly because of the increased yield, but also because they were free to modify and adapt the method, unlike a single technological fix that cannot be easily adapted locally.

In Java, farmers tried to revive an old practice that can cut costs, while cooperation with a farmer-friendly shop under the fair trade regime ensured the income of farmers switching back to sustainable practices.

Such complex issues as have been described cannot be solved through a single technological approach such as GM technology. Instead, what is needed is a complete paradigm shift to a more holistic (but diverse) approach that takes these complex issues and the various sustainable agricultural principles into account. This new holistic paradigm would integrate diverse socio-economic, cultural and ecological aspects with adaptive technology development based on local knowledge and innovation, and local resources.

Chapter Four

THE NEED FOR A PARADIGM SHIFT

A PARADIGM shift, especially in knowledge systems, is needed because the current conventional agriculture system, and its extension to GM agriculture, is based on a dichotomy between single technical knowledge system and diverse local knowledge systems. In fact, diverse local knowledge systems have been either ignored or marginalized. The following example illustrates this point. About 50 years ago, Mukibat, an Indonesian farmer, devised a technique that can increase the yield of cassava by five times or more. He merely grafted cassava tubers onto the root of a wild rubber tree from the same genus as cassava (*Manihot*); this gives the growing tubers more access to sunlight and nutrients (Forest et al., 1994, in Fernandes et al., 2002). Since then, this has been called the Mukibat technique. Yet, this technology has aroused little scientific attention and was only reported in the literature more than 20 years later. It could reflect the indifference or ignorance among researchers about farmer innovation, or simply the low status accorded to cassava as a staple crop despite the fact that hundreds of millions of people depend on it for sustenance (Fernandes et al., 2002).

The Mukibat case is a clear indication that the current scientific system does not accommodate local knowledge systems. Yet, any new technological innovation that comes only from the scientific and technocratic communities will not solve the food

and agriculture problems facing the world today. Instead, a multi-stakeholder process, diverse knowledge systems and consideration of the interlinkages between all aspects of agriculture are needed to solve these problems.

The basic paradigm shift needed is the recognition that governments, scientists and corporations cannot feed the world in the absence of policies and practices that allow communities to feed themselves. Thus, the solution lies not in feeding the world, but in allowing the world to feed itself (Greenpeace, 2001). And this is a complex problem that requires a holistic paradigm, policies and practices, not a single, quick technological fix.

To bring about the paradigm shift in agriculture, the following five elements are necessary.

First, we need to recognize that *alternatives to conventional and GM agriculture exist.* As stated before, many of these so-called alternatives are actually mainstream practices in many parts of the world. They exist as local innovations, and are dynamic in the sense that they can be modified to adapt to current situations. What is urgently needed is the right institutional, economic and policy support to ensure that these alternatives are scaled up.

Second, *farmers are innovators and applied scientists at the micro level.* They have the appropriate knowledge about their work and local socio-ecological conditions. The Mukibat technique is a case in point. Ignoring such innovative practices is technocratic arrogance that hinders efforts to achieve food security. The lack of recognition and acceptance of indigenous knowledge has regrettably led to many (although not all) mainstream scientists ignoring traditional farmers' rationales and imposing conditions and technologies that have disrupted the

integrity and sustainability of native agriculture (as argued by Altieri).

Third, *diversity and interlinkages of agroecology and socio-culture must be recognized and taken into account.* Conventional chemical- and technological-based farming systems have converted agri-"culture" from a socio-cultural and ecological process by delinking the technical aspects from other socio-cultural and ecological processes. While, in traditional systems, social relationships and cultural patterns govern technical know-how, the modern practices reduce such social systems into "monoculture technical know-how devoid of (local) culture". As an example: the world cannot plant a single Bt cotton variety all over the earth from the US to Australia through Africa and Asia, where ecosystems and socio-cultural systems differ. A holistic food production system must be put back in place.

Fourth, *we need to get the policies, institutions and incentives right.* The current banking system, for instance, favours chemical- and technological-based agriculture for credit loans. Governments, often centralized, institutions and policies wipe out diverse local and indigenous institutions that govern agroecological systems, as is shown in the *subak* case. *Subak* used to be a self-organized irrigation institution until the government took over irrigation management. Such local institutions, if they still exist, need to be supported rather than demolished. Similarly, appropriate government policies are required to protect, nurture and develop local agroecological systems.

Fifth, *any agricultural innovation must guarantee equity for the farmers.* Many technological innovations widen the gap between rich and poor farmers as they are not governed through local institutions. GM technology, for instance, can only be

adopted by rich landowners who can take higher risks in agricultural practices. The Green Revolution process has shown how farmers become impoverished when they enter a debt trap, usually through credit to buy agrochemicals, as shown by the case in India cited above.

Finally, it cannot be overemphasized that the world will feed itself better and in a more sound and ecological manner through *farmer-driven, locally adaptive and diverse systems.*

Endnotes

1. The earliest historical mention of *subak* is found in Balinese ancient records from 1071. However, the system could have been in place before that, as wet land rice cultivation was mentioned in the Sukawana AI record in the year 882 and the term "water channel digger" (*undagi pengarung*) was mentioned in the Bebetin AI record in 896 (Purwita, 1997). For an interesting account and understanding of *subak* as a socio-cultural-religious system, see Lansing (1991).

2. Sutawan (2004) in a personal communication said that the socio-religious aspect in Bali is so strong that when the irrigation system was taken over by the government, the tertiary water channel was still managed through the *subak* system. However, the current threats to *subak* are posed by tourism development and the decreasing profitability of the agricultural sector.

3. Information from an interview with farmers in Central Java as part of an ongoing process of documentation of sustainable agriculture practices by Third World Network (TWN).

4. Zhut et al. (2000, cited in Uphoff, 2002c) reported that planting rice varieties that are susceptible to blast with non-susceptible varieties reduces blast disease by 94% compared to rice grown in monoculture. The yield from susceptible rice varieties was increased by 89%. This was first practised in 1998. Disease reduction was so successful that by 2000 farmers no longer used fungicidal sprays and the method was used over 40,000 ha.

5. SRI is a method of rice cultivation that combines using less water, less seeds and more organic fertilizer. In SRI, the field does not have to be flooded; rather, excess water has to be drained. Seedlings are transplanted when they are only two weeks old and planted farther apart, with one seedling in one hole instead of several seedlings. The harvest is often more than double that under the conventional method. For more detailed information on SRI, see http://ciifad.cornell.edu/sri.

6. Notes from ongoing documentation of sustainable agriculture practices in Indonesia by TWN.

References

Altieri, M.A. (2002). Agroecological principles for sustainable agriculture. In Uphoff, N. (ed.), *Agroecological Innovations. Increasing Food Production with Participatory Development*. Earthscan, London.

Buchori, D. (2006). Transgenic Organisms: Potential Environmental Impacts in SE Asia. PowerPoint presentation at SE Asia Training on Holistic Foundations for Assessment and Regulation of Genetic Engineering and Genetically Modified Organisms by GENOK, TWN and IPB. Bogor, Indonesia, February 2006.

Fernandes, E., Pell, A. and Uphoff, N. (2002). Rethinking agriculture for new opportunities. In Uphoff, N. (ed.), *Agroecological Innovations. Increasing Food Production with Participatory Development*. Earthscan, London.

Greenpeace (2001). *Recipes Against Hunger. Success Stories for the Future of Agriculture*. Greenpeace International with Brot fur die Welt, Amsterdam.

Kuruganti, K. (2005). Eco-savvy village shows the way. http://www.forachange.co.uk/index.php?subjid=67&stoid=484 (accessed December 2004/January 2005).

Lansing, S.J. (1991). *Priests and Programmers. Technologies of Power in the Engineered Landscape of Bali*. Princeton University Press, Princeton, New Jersey.

Lim, L.C. (2006). Yields rose 79% from sustainable agriculture in South. *South-North Development Monitor (SUNS)*, No. 5967, 16 February 2006. TWN, Geneva.

Purwita, I.B. Pt (1997). Kajian Sejarah Subak di Bali. In Pitana, I.G. (ed.), *Subak Sistem Irigasi Tradisional di Bali: Sebuah Canangsari*. Upada Sastra, Denpasar.

SRI Group, the (2006). SRI Activities in Cambodia. http://ciifad.cornell.edu/sri/countries/cambodia/index.html (accessed 14 February 2006).

Uphoff, N. (2002a). Introduction. In Uphoff, N. (ed.), *Agroecological Innovations. Increasing Food Production with Participatory Development*. Earthscan, London.

Uphoff, N. (2002b). The agricultural development challenges we face. In Uphoff, N. (ed.), *Agroecological Innovations. Increasing Food Production with Participatory Development*. Earthscan, London.

Uphoff, N. (ed.) (2002c). *Agroecological Innovations. Increasing Food Production with Participatory Development*. Earthscan, London.

PUTTING FARMERS FIRST IN SUSTAINABLE AGRICULTURE PRACTICES

Given the environmental and health concerns attached to conventional agriculture and genetically modified crops, the need for an ecologically and economically sustainable form of farming is pressing.

This paper examines the key principles of sustainable agriculture, which is defined as a holistic approach to food production and community welfare, as opposed to the narrow technological approach of conventional agriculture. Drawing on local and traditional knowledge and driven by farmers' innovations, sustainable agriculture integrates technical know-how with the socio-economic and cultural aspects of the community in which it is practised.

This paper provides examples of successful adoption of sustainable agriculture practices in developing-country farming communities. The author also outlines the elements needed to effect a broad-based transition to sustainable agriculture systems which will yield economically productive, ecologically sound and socially just outcomes.

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